Reactive Routing Algorithms for Data Object Routing in Data Aware Networking

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Abstract: *Data aware networking is under the process of making a new milestone in the area of networking domain. In data aware networking, data items are referred with the data object's unique name or its id number. Publishing and maintenance of data objects is a prominent research area for the researchers working in data aware networking. The maintenance of data object includes data object publishing, data object storage, data object forwarding to the end users. The data object can be made available to the users either reactively or proactively through data object agents. This paper proposes reactive data object routing management system.*

Keywords: *Data aware networking, Data Objects, World Wide Web, data sharing, Future Networks*

I. INTRODUCTION

Data aware networking (DAN) is a networking approach for sharing data items based on the context of information [6]. In DAN, the data items are referred to as data objects. Each data object will have its unique name and identification number which enables the publishers to distribute data objects among the World Wide Web and allow the users to retrieve the data in an efficient and adequate manner with suitable mechanisms and routing algorithms. The data aware networking enables the name or identifier based communication of data objects by providing mechanisms to publish data objects, locate data objects regardless of its location, respond and supply of valid data objects to the user, route and process user requests, proper usage of network resources allowing the users to have higher throughput and lower latency.

DAN recommends a unique name to all data of different categories in order to enable name based communication [4]. The users of DAN can get the required data objects not only from the Original location but also from any intermediate nodes in the network with the cached data objects. DAN also makes it sure that the users will always be provided with a latest updated copy of the data object by removing out dated objects as and when they are invalid. It also provides the user with suitable security mechanisms to maintain data integrity of data objects [5]. Every object in DAN should be digitally signed by its publishers in order to maintain the origin and integrity of the object. The data aware networking also categorizes the data objects into different categories so that the user can be able to access the data object of required category.

DAN also keeps the history of data transfer and also makes note of the frequency of data objects so as to maintain the copies of the data in the intermediate nodes so that the users can access the required data object from a nearby location as and when required. The history of data transfer also helps the DAN to automatically send the data objects to the required users based on their usage history and frequency. For this purpose, the Data aware networking maintains different routing algorithms and uses the suitable one based on the usage history of user and also the data object. These routing algorithms are sometimes reactive and sometimes proactive.

The users of DAN need not maintain end to end connection for managing hosts thus simplifies the mobility aspects of the end terminals. The maintenance of DAN by the operators is also made simplified by providing the operators with mechanisms to minimize the resource usage and energy consumption [7]. DAN also allows the data objects to be stored in intermediate nodes and be retransmitted by the intermediate node on behalf of the host to adapt to varying networking conditions.

DAN also supports a variety of application programming interfaces (API) for data object distribution and data object retrieval. Most popular API s of them includes put/get and publish/scribe. In the put/get API, application can be able to request and pull a data object from its serving network [8]. In addition to this, The publish/subscribe mechanism also allows the

applications to make an advanced request of what data object is needed, so that the data objects can be sent to them as and when it is published.

II.   DAN SYSTEM

Next generation networking separates service systems from transport systems. Data aware networking is a networking of data objects for publication and sharing of data items at service level. The conventional way of data transfer occurs at data link layer and network layer. Data routed are packets and packets are the basic data unit in conventional routing systems [1]. The data aware networking (DAN) is built on the top of conventional networking duly utilizing conventional networking procedures. In DAN, data objects are touted at presentation or session layer. Such routing is logical routing which in turn happen using conventional routing techniques. The data objects are maintained by the publisher of data objects and such data objects are utilized by higher level client systems. Data objects are published by publishers and such data objects are routed to the client through intermediate object managers. These object managers act as agents on behalf of publishers.

The data objects are supplied to the object managers as and when required reactively or in advance proactively. The next section describes the structure of header of data object required for data object routing.

III.   CHARACTERISTICS OF DATA OBJECT

In Data aware networking, end users are allowed to access required data items in the World

Wide Web by referring data object's name or identification number. In WWW, one can find millions of data objects. These data objects can be categorized for proper usage and maintenance. Certain data objects are ever green and no need to update such objects. Other data items required to be updated periodically. Such period may vary in terms of years, months and sometimes fortnights, weekly, daily such as news papers etc., in such complex data object system, one can need to be capable of selecting his required data object with required version. In these lines, the characteristics of data objects are useful in selecting of required data object.

The required characteristics of data object are self explanatory data object name, self explanatory and meaningful id, category of data object, version number of data object, publisher details, author details, keywords of data object, details of updation frequency of data object, size of data object, object editor details, language of content, privacy policy, patent rights, government authorized digital signature etc..,

IV. DATA OBJECT BANKING

Data objects are published by authors through authorized publishers. The authorized publisher will prepare data object in prescribed format with the details of header, characteristics, size and other details of content etc.., Such full pledged data objects are published , The publisher maintains data object bank in efficient storage and retrieval system of data objects.

In data aware networking systems, the major stakeholders are authors, publishers, clients, data object managers and data object regulating authority (DORA). The overall controlling system of data aware networking in legal aspects is maintained by DORA.

DORA frames regulations for publisher registration, object manager registration, author registration, and categorization of data objects, updation frequency of data objects, feedback systems etc.., and Different categories of data objects are determined by DORA. An author can register one or more publishers to publish data objects of his own interest. The authorized authors shall make a data object and publish it through the publisher. Such published items can be made accessible through category wise agents. The published data objects are indexed among all agents. As and when requested by the client, data objects are transferred to the client through agents. While processing the client requests, frequency of data objects will be maintained by agents.

V. DATA OBJECT ACCESSING

Data Aware Networking consists of major functional entities viz., author, publisher, formatted data object banking system, data object agents and data object managers, end users. The hierarchy of such system is shown below:
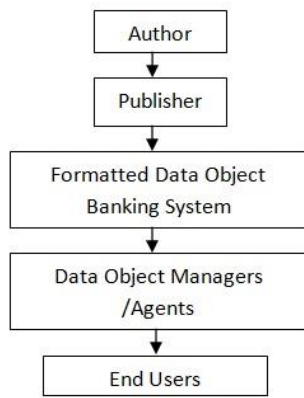
The internal part of data aware networking system consists of publisher and data object manager. The authorized end users are the external entities for data aware networking system over interacting with DAN dynamically or arbitrarily. The use case diagram of such system is shown below:
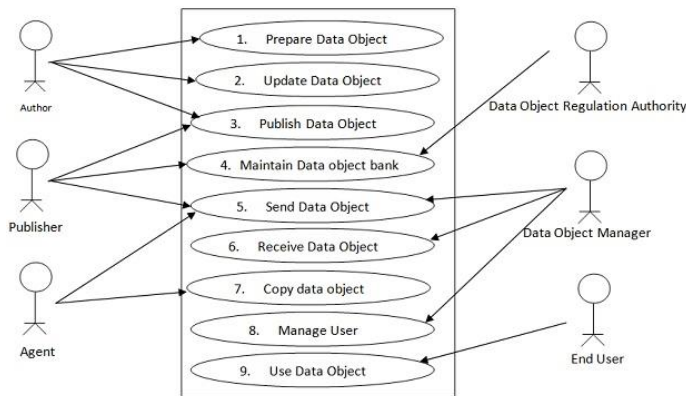
VI.   REACTIVE ROUTING

The contents of data object are prepared by authors. These contents are verified in all respects and will be sent to publishers for publication. The authors themselves shall register in one or more publishers for publication of their articles. The publishers will publish the articles after preparing them in a prescribed format and also maintains the data object bank.

The publisher will periodically update the catalogue of data objects and will share it to all data agents and data object managers. The data object managers are responsible for providing the catalogue to end users. The data object managers are also responsible for providing catalogue of publishers pertaining to a data object.

The user will send a request to the data object manager for his required data object. Based on the request, the data object manager will search for relevant data objects and provides possible list of data objects to the users. The user then will choose his interested data object and formally places an order for required data object to data object manager.

The data object manager will compile the user request and forwards the same to the nearest agent. The agent maintains copies of likely required data objects in order to provide data objects immediately to the users. If the required data object is available with the agent, the agent will send a copy of data object to data object manager which in turn provides the same to end user.

If the required data object is not available with the agent, the agent will place a request to the publisher for the data object. The publisher then will send a copy of data object to the agent, the agent will forward the data object to the required data object manager and will also keep a copy of the data object for future reference. The data object manager wills in turn forwards the data object to the end user.

DAN introduces data object banking system for commercial and non commercial business management. Data object publishing, routing, agent management and functioning of object managers are crucial for the success of data aware networking systems.

VII. CONCLUSION

Providing of data objects to end users in data aware networking is a significant issue. The major functionalities involved in this regard are publisher; data object agent and data object manager. The data object manager will take care of end user maintenance. Agents are allowed to keep a copy of data object for future use.

Such reactive data object routing system will provide lot of flexibility, simplicity to the end users for proper selection and accessing of required data object. Maintaining data catalogue, searching catalogues for required data objects, preparing or consolidating the list of data objects for selection by the user are significant research issues to address the future scope of this work.

VIII. REFERENCES

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